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RESEARCH ARTICLE

Science Communication in Context of China: Reducing the Regional Imbalance

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ABSTRACT

Science communication is influenced by various factors of social context, such as politics, economy, culture and history, and these factors have different impact on science communication in different time and space domain. China is a country with appreciable regional diversity, where exist huge gap in economic, social, educational and science and technology development. The imbalance in development makes social context of science communication a prominent feature in the country. In China, the demand of citizens on science communication presents diversified and complex features, which were intensified by the leapfrog development of science communication pattern. Based upon above considerations, China is taking public science communication strategy in a localized way by government and the society as well. This paper discusses the functions which science communication played in reducing the regional imbalance in China.

KEYWORDS: Social Context, Science Communication, Regional Imbalance

Introduction

Social Context in China

Compared to other countries, the Chinese social context is characterized extremely by regional specificities. These localized features embodied in the society, economy, culture, science and technology, history and other aspects. China's science communication is not only influenced by changes in social contexts which is similar to the rest of the world (Zhai, 2012), but also faced another layer of challenge that is brought by China's distinctive regional specificities. Through the

comprehensive consideration of China's social context, the authors think that the two aspects of China's social characteristics directly influence science communication. The first important characteristic feature is regional imbalance and the second is the diversity of Chinese population structure.

Unbalanced Regional Development

Chinese unbalanced regional development is rooted in the localized geographic structure in China. Moreover, the imbalanced regional development in China has resulted into a social context of science communication. China covers a wide geographic area with extensive longitude and latitude having complicated and varied landscapes. The geographical spread of the country ranges include low-lying from west to east and the most extensive coastal region in the southeast. Climate resources are distributed unevenly from subtropical zone to temperate zone, with rainfall decreases progressively from southeast to northwest (Chen and Tang, 2005). Different geophysical features of the country have resulted into varied natural resources in different regions such as abundant oil, gas, coals in Eastern China, northwest areas have abundant biological resources such as wool, high-class cow milk etc., the coastal areas of Southeast China have flourishing foreign trade. Moreover, the difference in state support for different regions is also the reason for imbalance in economic development in different regions in China.

The geophysical characteristics of China have greater impact on the social, economic and cultural aspects in a region and thus influence people's cognitive structure and scope for communicating various ideas including science and technology. Report on China's development index by Renmin University (2012) has also showed that the regional differences are increasing in China's society since 2005 (Yuan and Peng, 2012).

Population Structure with Chinese Characteristics

Data from the National Bureau of Statistics of China showed that Chinese citizen's population structure possesses significantly localized feature on natural structure, social structure and

consumption structure. In terms of overall natural structure of Chinese citizens, the proportion of Chinese urban and rural residents is close to 1:1, with Han nationality accounting for 91.5% and minorities accounting for 8.5%. The sex ratio is 1.05:1. The old-age dependency ratio of Chinese citizens was 12.3% in 2011 and population structure of citizens tends to be aging progressively older (National Bureau of Statistics of China, 2010).

In terms of social structure of Chinese people, although the education level of Chinese citizens has improved significantly, as in 2011 Chinese citizen's per capita education years was 8.5 years, the new labour force average years of schooling was over 10 years, both of them were above the world average (see *People*'*s Daily Online*, 2013). The general education level of Chinese population is still low. Data from the sixth (2010) census showed that, people receiving higher education and above accounted for 8.9% and people receiving secondary education accounted for 53%. In addition, people receiving primary education accounted for 27% and the illiteracy rate in the country was 4.1%.

In 2011, per capita disposable income of China's urban households was 19,109.4 Yuan and that of China's rural households is 5,919.0 Yuan, showing significant gap between the two populations. It is worth mentioning that the annual per capita consumption expense of services in culture, education and entertainment of urban households is 1627.6 Yuan and that of the rural households is 366.7 Yuan. This per capita consumption is comparatively low in China than in many developed countries in the world.

Moreover, the Report on Development of *Floating Population*[1] in China in 2013 issued by the National Health and Family Planning Commission showed that there were 236 million floating population in China in 2012. The migration is

[1] Floating Population refers to migration population from Rural to Urban areas. Some of them live in urban areas for a short period and others live in Urban for a comparative long time. But both of their household registrations are still in rural areas.

mainly among younger population, which seeks new pastures for earnings (NHFPC, 2013).

To sum up, science communication needs to deal with China's local social context characterized by urban-rural imbalance, regional imbalance and diversity of population structure. Composite overlay of various factors, in the Chinese social context, complicates the trend of science communication development.

Diversity of Chinese Citizens' Demands on Science Communication

The social context of science communication of China presents both characteristics; on the one hand it includes common features of globalization and on the other there are distinct culture-specific characteristics. Its influence is highlighted in the imbalance in development of Chinese civic scientific literacy[2] and diversified demand for science communication among the Chinese population.

Imbalanced Development of Scientific Literacy

Chinese civic scientific literacy differs significantly among rural and urban population because of skewed economic developments in the regions. Scientific literacy rate among urban population is 4.9 and that of rural population is 1.8 percent according to a survey in 2010. Regional differences are also evident in terms of civic scientific literacy rate where eastern region with higher literacy rate (4.6 percent) than other regions. Scientific literacy levels of Chinese citizens are significantly differentiated in gender and according to the 8th Civic Scientific Literacy Survey in China, which was accomplished in 2010, the basic scientific literacy was 3.7% among males and 2.6% among females. It is also important to note here that basic scientific

[2] The basic scientific literacy of citizens, generally refers to knowing some necessary knowledge of science and technology, mastering basic methods of science, building up science thoughts, advocating science ethos and having the ability to apply them to resolve practical problems and participate in public affair. The definition is described in the Outline of the National Scheme for Scientific Literacy, a Chinese government document issued in 2006.

literacy among the Han community was 3.3% and that of other minorities was 1.9% (Ren, 2011).

Scientific literacy level is also influenced by some demographic factors like age, education level, occupation, interest in S&T issues, etc. The basic scientific literacy decreases with increase of age of Chinese population, while it increases with improvement of education level of the population. The scientific literacy level among citizens undertaking different professions is also different. The professionals are with highest scientific literacy level and people engaged in agriculture, forestry, animal husbandry, fishery and domestic work. Scientific literacy level has high correlation with people's interests, attitude and engagement of science and technology issues (Liu *et al*., 2011)

Diversified Public Demand

Over the years, the Chinese civic scientific literacy level has improved significantly. The percentage of adult citizens with the basic scientific literacy has increased from 2.25% in 2007 to 3.27% in 2010. Due to the diversity of China's population structure, along with the gradual rise of public attention for science and technology, Chinese people's demand for science communication has increased. It has also been revealed from the eighth civic scientific literacy survey that Chinese public interests in science and technology topics are different among different sets of population groups. Male respondents belonging to the Han community and people with higher educational level are more interested in scientific and technological information.

In response to the query 'the most interested science development information for you', various socio-cultural groups provided different responses in China. Elderly female respondents showed more interest in medicine and health related issues. Urban residents showed higher interests in information about environmental science and pollution abatement. Younger respondents were more interested in computer and network information.

Diverse socio-cultural set-up and their needs result into access to different media channels for acquiring scientific and technological information. Urban residents make more use of

newspapers, Internet and books to obtain scientific and technological information compared to rural residents. Respondents from the eastern region of the country make more use of newspapers and Internet than those in the central and western region. Elderly people in the age group 30-49 years prefer to obtain scientific and technological information through newspaper. Respondents above 50 years of age preferred to obtain scientific and technological information through television and radio (Cheng *et al*., 2014).

The survey analysis also revealed that urban respondents participating in large science popularization activities such as science and technology week, science and technology festival and science and technology day account for 28.9% and rural residents account for only 19.9%. The proportion of rural residents engaged in science and technology consultation (35.1%) and science and technology training (42.3%) is higher than that of urban residents (29% and 30% respectively).

The proportion of urban residents who have visited science and technology venues is 41.5% and this percentage in respect to rural population is 20.2%. 64% of urban residents have used public libraries or reading rooms and 42.5% rural residents have used such facilities. Science museums are 'not available locally' was the main reason for not going to science and technology museums and 28.2% urban residents and 44% rural residents responded so. Similar trends were found for visiting the natural history museums.

New Media Booming

Information technology revolution has opened up a new era of media and new media products. The Internet is gradually replacing traditional media and has become a major means to obtain information including scientific and technological information for the Chinese public. Recently, new media technology represented by mobile terminal has brought radical development to science communication. The survey report of China Internet Network Information Center (CNNIC) shows that the scale of China’s instant message netizens has reached 618 million by the end of 2013 (CNNIC, 2014), including 441 million urban residents and 177 rural residents. Interactive and

multi-direction of communication and fragmentation of language have become core characteristics at the early stage of the new media era. The birth of new media has changed the traditional media work habits and expression system.

With rapid development of digital technology and change of mass media functions and its role, new media represented by network medium has not only changed the means of communication, but has also made tremendous impact on the use of words and peoples' deeds. Combined with the communication function of special linguistic symbol of the new medium, a new area of science communication in context with digital media communication has emerged.

Change of social context brought by new media intensifies the complexity of science communication relations. People's cognition pattern, communication model, and habits to obtain information knowledge have changed drastically. Firstly, a lot of people have developed the cognition habit of shallow reading and fragmentary interaction. User groups have grown with the spurt in instant communication platforms, such as Weibo[3] and WeChat, in China. Secondly, the traditional linear unidirectional mass media are marginalized and are fading away in terms of communication. According to a recent DCCI[4] report, television audience ratings dropped 13% in 2011 in China. There were 40 million Chinese people who said that they would no longer be watching television, 65% of these respondents included young people.

Further, new media brought new challenges to China science communication including the following aspects. The traditional paradigm of science communication is gradually declining and marginalized in the public perception that could lead to public alienation of science. Chinese important organizations in science communication are facing the pressure of 'voice to weaken', and some new little-known science communication organizations that link with new media closely are mushrooming for taking

[3] *Weibo and WeChat* are instant messaging and social networking software on the mobile terminal, which have hundreds of millions of users in China. The function of *Weibo* is similar to Twitter in western countries.

[4] DCCI (Data Center of China Internet) www.dcci.com.cn.

science to the public. Therefore, it is high time to formulate strategy of science communication for the Chinese public accustomed to new media channels.

Strategies of Science Communication in Reducing Regional Imbalance

Strategy of China Science Communication Policy

Science communication policies[5] in China are driven by national demands and requirements of the public. It not only has to adapt China's unique social context, but also satisfy the diversified demands of pubic in science communication.

These policies are promoted by government sectors and also by mobilizing participation of various social organizations that are working closely with the society. Government and social organizations jointly build various activity platforms to enable the Chinese public to participate in science communication events. The feedback and new demands of the public are generated in the process of participating in science communication activities.

In order to mobilize the power of social participation, China adopts the pattern of '*large-scale union and cooperation'* and cooperates across the whole country. At present, there are over 20 national ministries and commissions, various research institutions, a large number of non-governmental organizations (NGOs), Ministry of Science and Technology, Ministry of Finance, Ministry of Agriculture, Ministry of Education, Chinese Academy of Sciences (CAS), China Association for Science and Technology (CAST), etc., which have participated in the social undertakings. Many large-scale social works of science communication have been launched by such organizations, individually or collectively. At the same time, these organizations mobilize other social agencies to

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[5] For example: *Directive Opinions on Strengthening Engagement in Science and Technology Popularization, the Law of the People's Republic of China on Popularization of Science and Technology,* and *The Outline of the National Scheme for Scientific Literacy* (2006-2010-2020), etc.

provide opportunity for the public to participate in science communication programmes.

Science Communication Strategy applicable to Different Target Groups

In order to adapt demands from different target groups, the current science communication policy in China has formed the implementation approaches on the basis of five action plans for scientific literacy improvement. The target groups have been categorized into minors, farmers, urban workforce, leading cadres and civil servants and community residents. Minors are receiving basic education in the process of construction of scientific literacy; farmers and labourers comprising the major portion of the population in China with less educational opportunities; urban workforce population is mainly the practitioners and creators of modern life; leading cadres and civil servants are main practitioners providing public service; and community residents are emerging urban populations emerging in the process of accelerating period of China's urbanization. Science communication modes and plans are respectively designed with regard to these target groups to meet demands on science communication of different groups.

Effect of Science Communication in Practice

In China, science communication and science popularization (SP) have been considered as similar concepts in certain context (Ren, 2013). As has been mentioned, the efforts of science communication or science popularization are meant for improvement of citizens' life-quality. In particular, the farmers in rural areas would grasp the skills in plant breeding after the scientific training by some experts, which could enhance the production in modern agriculture. As a result, the living and education conditions of the citizens are improved. The status of imbalance in economy and culture can be reduced by communicating scientific ideas related to agriculture. Some typical practices demonstrate the positive impact of science communication on society.

Formation of 'National Exemplary County (City or District) for Science Popularization' from the Inspiration of 'Rejuvenating County by Science Popularization'

The county level division is crucial in China's political administration system as the division is an important link between rural and urban population.

The activity of building the 'National Exemplary County (City or District) for Science Popularization' is directed towards enhancing the scientific literacy level of local citizens for social development. This programme was initiated by China Association for Science and Technology (CAST) in 1998. The basic idea of this activity is to grant finance support from the local governments so as to encourage and support Science Popularization.

The programme is open to more than 2800 counties (cities or districts) in China, but only a certain number of counties are involved in the programme to become the exemplary counties. The exemplary counties can act as models for other nearby counties in their developmental programmes. The programme organizer, CAST, has developed the evaluation indicators system for selecting the exemplary county. The indicators of rural science popularization are the important aspects of overall performance of a particular county. The indicators can be the quantities of rural S&T training, S&T outreach activities in the rural areas per year, etc. It is noteworthy that from 1998 to 2005, there were three batches of counties that joined the programme and 713 counties were honored as the National Exemplary Counties (Hu and Chen, 2011).

In order to continually encourage the counties and keep up their enthusiasm to innovate methods of science popularization, the honour title has a validity period. In 2009, transforming a county into a National Exemplary County for the period of 2011-2015 was initiated; 921 counties applied for the programme in line with the principle of 'voluntary application, ladder-up transformation, active promotion, dynamic management, constant innovation'. In the new round, starting from May 2011, 902 counties were granted the status of National Exemplary Counties after assessment.

As a matter of fact, the programme was the outcome of the inspiration from the experiences of a Chinese Southern County, Ninglang in Yunnan province (Hu, 2012). Ninglang is a minority county located at a high altitude with low economic development level. In 1985, the local government realized that the economic development and human resources should be emphasized in the region. A human resources training office was set up in the county, which worked in association with the local association for science and technology. Teaching local farmers' advanced skills in agriculture became the focus of the training programme. Before the training, the members of the human resources training office analyzed the farmers' economic conditions and their education background. Considering the first-hand information, the experts designed the specific training programmes for different villages and organized programmes to share their knowledge and skills with the farmers.

The training in Ninglang was started with fundamentals to suit the practical requirement of the daily life of local people and was gradually upgraded to the advanced technologies in agriculture.

The prominence of Ninglang's experience is that the local government was fully aware of the function of the people's acumen that could be exploited by means of science communication or science popularization. Although the local government's financial condition was not good, the budget for science popularization was secured. In addition, the government encouraged personal donations to support the science popularization programme in the region. In the 1990s, it was decided that the head of the county would donate 50 Yuan (ca. $7) per year and the ordinary staff would donate 12 Yuan (ca. $1.7) per year. It was indispensable to supplement the deficiency of the vast training cost in the county.

Ninglang's experience from 1985 to 1995 was concluded as 'Rejuvenating County by Science Popularization'. One of the core members from the Ninglang human resources training office preferred the programme on 'science popularization' to 'science and technology' or 'scientific research'. In his opinion, 'The county level has no capability to carry out advanced scientific research. So, the work in science and technology field

on county level is mainly science popularization'. CAST quickly realized the successful experience of Ninglang and found it worth spreading to other regions. The local government's active attitude towards science popularization should be encouraged and their support for the field be carried forward. Ninglang, thus, set an exemplary model for the counties in China to help local farmers and get rid of poverty by increasing scientific literacy. Therefore, it becomes a good case that science communication or science popularization reduces the imbalance prevalent among the regions.

Differences of 'SP Action Plan at Grass-root' in Rural and Urban Areas

Programme of 'SP Action Plan at Grass-root' was initiated by CAST in 2012. It contains two sub-programmes; one is suitable for rural areas and the other fits for the urban communities. The villages in the rural and communities in the urban are typical 'grass-roots'. It is noteworthy that the two sub-programmes were not launched simultaneously.

Since 2006, the programme 'Benefiting the Farmers and Rejuvenating the Countryside through SP' was implemented by CAST and the Ministry of Finance. 'SP Action Plan at Grass-root' started as an integrated programme with 'Rural Special Technology Associations', 'Rural SP Demonstration Bases' and 'Minority Nationality SP Work Teams'. The main objective of the programme was to expand the scale or improve the quality of the science popularization activities in rural areas.

By the end of 2013, 10050 advanced groups or individuals received special grants for effectively implementing this programme. They included 5132 'Rural Special Technology Associations', 2368 rural SP 'Demonstration Bases', 50 'Minority Nationality SP Work Teams' and 2500 advanced individuals. The total expenditure on this programme was RMB 1.65 billion Yuan. Mobilized by the National Program, a few provincial finance departments also earmarked funds for the programme. The financial support to SP in rural areas of China achieved an unprecedented height and the effect is remarkable. It was reported that the farmers scientific literacy level was

enhanced at a faster speed, agricultural production increased and the life-quality of farmers was significantly improved.

With the acceleration of urbanization in China, the science popularization in urban communities became a focus agenda. The programme 'Benefiting the Citizens in Urban Communities through SP' met the demands of the activities. The purpose is to advocate and lead a scientific, healthy and civilized life in urban communities by SP activities. The approach is similar to the programme targeted towards the rural areas. Some urban communities were awarded which could act as examples for other urban areas. The programme started in 2012, and was integrated with 'SP Action Plan at Grass-root'.

Discussion

Firstly, decision-makers and researchers should give more importance to the study on social context of science communication, and discuss its importance in shaping and impact on science communication mode, framework and system model. The effort should be made to bring social context into the research of science communication so that it can theoretically enrich the research on diversified science communication modes under different social contexts.

Secondly, analysis and studies should focus on the evaluation of relationship between science communication and socio-economic development in regional terms to bridge the imbalance.

Finally, based on the different social context realities, a strategy should be selected and applied in science communication. Selection and adoption of appropriate science communication models and design science communication (SP) programmes also need consideration keeping the social context in mind. Considering the imbalanced development in China, the science communication strategy should meet the local demands.

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